ANIMAL HUSBANDRY DIVISION
HAWAII AGRICULTURAL EXPERIMENT STATION
HONOLULU, HAWAII

Under the joint supervision of the

UNIVERSITY OF HAWAII
and the
UNITED STATES DEPARTMENT OF AGRICULTURE

Progress Notes on Experiments and Other Items of Interest.

No. 3

November, 1933

These progress notes on experimental work and other items of interest to livestock men in the Territory are issued from time to time by the Animal Husbandry Division. You are invited to suggest other lines of research that you deem important and to submit inquiries to the University.

PINEAPPLE BRAN VS. BEET PULP AS SUPPLEMENTS TO GRAIN RATIONS FED TO DAIRY COWS

Purpose

Both beet pulp and pineapple bran have been and are being used as supplementary feeds to the grain rations and roughage generally fed to dairy cows in Hawaii. Beet pulp, having been in the field longer, is better known and commands a higher price. The purpose of this experiment was to get data on the relative merits of these two feeds when fed to dairy cows and to determine, should beet pulp prove superior, whether it is enough better to justify the higher price it commands.

Plan of the Experiment

Eight purebred dairy cows were divided into two lots of four each, Lot I and Lot II. In dividing these cows, such factors as age, reaction to Bang test, number of days since last calving, date due to freshen, and production of milk were considered and equalized as nearly as possible between the two lots.

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The reversal system of feeding was followed. Lot I was started on the pineapple bran feed (fed dry) and after five weeks was shifted to beet pulp (soaked in water for twelve hours) and after another five weeks was returned to the pineapple bran feed for the last five weeks of the fifteen week test. Lot II was started on beet pulp, shifted to pineapple bran and then back to beet pulp, the changes in feed in both Lots I and II being made at the same time.

Only the last four weeks of each five-week period were used in computing results. The mean of the first and third periods of each lot was compared with the results of the second or middle period in order to compensate for the decreasing production due to advancing lactation.

All the cows received the same roughages and grain mixture. Individual records of feed consumed, milk production, butter fat tests, and body weights were obtained and recorded.

Feed Prices

The prices of feeds prevailing at the time of this experiment were as follows:

Roughages	Price per ton		
Green Alfalfa	$10.00	assumed	value
Green Sudan	7.00	"	"
Green Napier	6.00	"	"
Green Merker	6.00	"	"
Green Guinea	6.00	"	"
Green miscellaneous grasses	4.00	"	"

Concentrates	
Rolled Barley	$21.00
Corn Meal	27.00
Wheat Bran	21.00
Coconut Oil Cake Meal	29.00
Linseed Oil Cake Meal	35.00
Raw Rock Phosphate	32.00
Salt	14.00
Beet Pulp	24.00
Pineapple Bran	16.00

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Feed Mixtures and Roughages

Average roughages fed daily to each cow.

		Pounds Digestible		
		Protein	Total Nutrients	Cost
6.7	lbs. Green Alfalfa	0.315	0.971	$0.034
16.9	" " Sudan	0.135	2.281	0.059
11.5*	" " Napier " Merker " Guinea	0.092	1.553	0.035
12.1*	" Miscellaneous Grasses	0.097	1.634	0.024
47.2	"	0.639	6.439	$0.152

*Based on Sudan analysis.

Standard Concentrate Mixture Fed

		Pounds Digestible		
		Protein	Total Nutrients	Cost
75	lbs. Rolled Barley	6.75	59.5	$0.788
50	" Corn Meal	3.75	42.9	0.675
100	" Wheat Bran	12.50	60.9	1.050
10	" Coconut Oil Cake Meal	1.99	7.1	0.145
5	" Linseed Oil Cake Meal	1.58	3.8	0.088
3	" Raw Rock Phosphate	---	---	0.048
3	" Salt	---	---	0.021
246	" Mixture	26.57	174.2	$2.815
100	" "	10.80	70.80	1.14
	Price per ton			$22.80

	Pounds Digestible	
Requirements:	Crude Protein	Total Nutrients
800 - 1100 lb. cow (maintenance)	0.56 - 0.77	6.340 - 8.717
14 - 32 lbs. 4% milk	.83 - 1.89	4.592 - 10.496
	1.39 - 2.66	10.932 - 19.213
Nutrients supplied in:		
Lot I - 47.2 lbs. Roughages	0.639	6.439
9.5 " Standard Mixtures	1.026	6.726
4.0 " Pineapple Bran	.096	2.080
	1.761	15.245
Lot II - 47.2 lbs. Roughages	0.639	6.439
9.6 " Standard Mixture	1.037	6.797
4.0 " Beet Pulp	.184	2.864
	1.860	16.100

The above computations merely show the average feeds fed to each cow. The larger, heavier producing cows were fed more than the average for the entire group so that protein and total nutrients were not a limiting factor in production.

Cows Used in this Test

Cow No.	Age in Years	Days since calving to Nov. 14	Due to calve	Average production on Nov. 6 and 13
Lot I				
62H	8	69	--	18.1
77G	6	73	--	18.3
85H	5	34	--	34.4
113H	2½	79	--	18.2
Average	5½	64		22.2
Lot II				
68H	7	32	--	26.2
104H	4	69	--	23.5
107G	3	86	--	19.1
109H	3	105	--	19.0
Average	4	73		21.9

Feeding Schedule

Cow Number	Lot I				Lot II			
	62	77	85	113	68	104	107	109
Inclusive days 1932-1933								
Nov. 24 - Dec. 28	PB	PB	PB	PB	BP	BP	BP	BP
Dec. 29 - Feb. 1	BP	BP	BP	BP	PB	PB	PB	PB
Feb. 2 - Mar. 8	PB	PB	PB	PB	BP	BP	BP	BP

March 9 - Returned to feed fed previously to November 24, 1932.

PB = Pineapple Bran BP = Beet Pulp

Body Weight of Cows

The eight cows were weighed at the beginning of the test period and every week thereafter on the same day throughout the test. They were weighed in the afternoon after being fed and milked.

Lot I averaged 939 pounds on the pineapple bran feed and 932 pounds on the beet pulp--a difference of 7 pounds in favor of the pineapple bran. Lot II averaged 876 pounds on the pineapple bran and 881 pounds on the beet pulp--a difference of 5 pounds in favor of the beet pulp. The average weight of all cows on the pineapple bran was 907.5 pounds and on beet pulp 906.5 pounds; hence, as regards maintaining the weights of the cows, beet pulp and pineapple bran were of equal value.

Individually, four cows averaged 10.7 pounds heavier on the pineapple bran and four cows averaged 7.7 pounds heavier on the beet pulp.

Butter Fat Tests

Composite samples of four consecutive milkings taken on the same days were tested in duplicate every week.

The butter fat tests of all cows on the pineapple bran feed averaged 4.07 percent, while those on the beet pulp averaged 4.11 percent, an insignificant difference of .04 percent in favor of

the beet pulp. Individually, three cows tested higher on pineapple bran, four tested higher on beet pulp and one tested exactly the same on both feeds.

Milk Production and Costs of Different Feeds

The most important details of production, amount of feeds fed daily, costs, etc. are shown in the following condensed table.

	Lot I		Lot II		Both Lots	
	With PB	With BP	With PB	With BP	With PB	With BP
Average lbs. milk per cow per day	19.89	20.89	23.50	22.89	21.71	21.89
Average percent butter fat	4.21	4.12	3.93	4.09	4.07	4.11
Total lbs. grain mixture fed per cow per day	9.1	9.1	9.9	10.0	9.5	9.6
Total lbs. beet pulp or pineapple bran fed per cow per day	4.0	4.0	4.0	4.0	4.0	4.0
Lbs. milk produced per lb. of grain and beet pulp or pine-apple bran fed	1.52	1.59	1.70	1.64	1.61	1.61
Roughage cost per cow per day	$ .139	$ .176	$ .176	$ .139	$ .158	$ .158
Feed cost per 100 lbs. milk	1.38	1.57	1.36	1.31	1.37	1.44
Feed cost per pound of butter fat	.328	.381	.347	.321	.337	.350

PB = Pineapple bran BP = Beet pulp

Better and more costly roughages were available and fed during the second period than in the first and last periods. This seemed to increase production costs more than it increased production. In the case of Lot I, which was fed beet pulp in this middle period, this operated to make the feed cost for the beet pulp fed group higher than it otherwise would have been ($1.57 per 100 pounds milk). Lot II was fed pineapple bran during this middle period and the feed cost was $1.36 per 100 pounds of milk, which was higher than it would have been had not the greater quantity of more expensive roughages been fed at that time. This results because the mean of the first and last periods is balanced against the second period making its influence as great as the first and last periods combined. When the results of Lot I and Lot II are combined, this unbalanced effect, due to excess roughage feeding during one period, is neutralized, which is the big advantage of the double reversal type of experiment. However, even here all other factors except the variable should be kept uniform if possible. This was done with the quantity of the concentrates fed, but it is more difficult to control roughages when they have to be harvested each day, and sometimes the supply of a given roughage becomes inadequate.

Summary and Conclusions

(1) There was no significant difference in weight when the cows were fed either beet pulp or pineapple bran.

(2) The average percent of butter fat was approximately equal, being 4.07 and 4.11 percent for the pineapple bran and beet pulp fed cows respectively.

(3) The average daily milk production for all cows was 21.71 and 21.89 pounds at a total feed cost of $1.37 and $1.44 per 100 pounds of milk for the pineapple bran and the beet pulp respectively. This shows that pineapple bran is just as effective and more economical than beet pulp in producing milk when used as a supplement to the grain and roughages fed.

(4) When the 4 pounds of beet pulp fed daily to each cow were replaced by a like quantity of pineapple bran, a saving of 32 percent in the cost of supplemental feeds resulted, because the cost of these supplemental feeds, per 100 pounds of milk, was 14.8 and 21.9 cents for the pineapple bran and the beet pulp respectively. Applied to the cost of the entire ration, the saving when pineapple bran was used in place of beet pulp amounted to nearly 5 percent.

(5) In general the percentage saving in the cost of these supplemental feeds will be the percentage difference in the ton cost of beet pulp and pineapple bran.

(6) The results of this one experiment suggest that pineapple bran fed dry is as valuable as soaked beet pulp as a supplement to the grain rations fed to dairy cows.

L. A. HENKE.